



John R. Kasich, Governor
Mary Taylor, Lt. Governor
Scott J. Nally, Director

May 9, 2013

Mr. Mark Durno, Chief
Emergency Response Section 1
U.S. EPA Region V
25089 Center Ridge Road
Westlake, Ohio 44145

**RE: MULLINS RUBBER PRODUCTS, INC., MONTGOMERY COUNTY,
CERCLIS ID # OHN000510489**

Dear Mr. Durno:

Ohio EPA requests U.S. EPA's assistance in conducting a removal action assessment at the Mullins Rubber Products, Inc. site, 2949 Valley Pike, Riverside, Montgomery County, Ohio 45404-2693 (see attached site location map). The site is located in a mixed residential, commercial, industrial neighborhood in Riverside, Ohio.

Mullins Rubber Products, Inc. (MRP) has been the subject of several federal site assessments over the past four years. Ohio EPA completed a Pre-CERCLIS Screening (PCS) report as part of the federal site assessment program on March 31, 2009. A site inspection (SI) was completed in August 2010, followed by an expanded SI (ESI) completed in July 2012. Ohio EPA is currently finishing a supplemental ESI (SESI). The purpose of these investigations was to determine if there had been VOC releases to soil or to ground water as a result of operations at MRP.


Field work for the SESI was completed in March 2013 and CLP data is pending. Preliminary laboratory and mobile laboratory screening data indicate that releases of tetrachloroethene (PCE) and trichloroethene (TCE) have resulted in shallow ground water contamination which extends from or close to MRP to at least MW-4 located on Hypathia Avenue (see attached SESI maps). MW-4 is approximately 850 feet west of MRP. A source area has not been documented but based on SESI preliminary data collected at SESI SB-14, the source is most likely on MRP or possibly on Paul's Garage property near SESI SB-14. Modeling of ground water concentrations of VOCs indicates that there is potential for vapor intrusion to occupied structures above the shallow ground water plume.

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Attached to this letter are the Removal Action Referral Form, the PCS Report Site Location Map, a map of SESI Boring Locations with Preliminary VOC Results, a map showing ground water contours measured during the SESI and VISL-Calculator Results.

Due to the potential hazards posed to neighboring homes and businesses from subsurface migration of solvent vapors, Ohio EPA believes that further assessment and possible removal actions by U.S. EPA are warranted. Randy Watterworth, DERR-SWDO is the Ohio EPA primary contact for this site and can be reached at (937) 285-6062. As always, please feel free to call me at (614) 836-8752 with any questions.

Sincerely,



Cindy Hafner
Chief
Division of Environmental Response & Revitalization

Enclosures

cc: Kevin Clouse, Assistant Chief, DERR-CO
Randy Watterworth, Senior Site Coordinator, DERR-SWDO
Mike Starkey, Manager, DERR-SWDO
Brian Nickel, Supervisor, DERR-SWDO

CH\bp

REMOVAL ACTION REFERRAL TO U.S. EPA

I. SITE LOCATION AND POTENTIALLY RESPONSIBLE PARTY INFORMATION

A. SITE NAME: Mullins Rubber Products, Inc.

B. ADDRESS/LOCATION:

2949 Valley Pike, Riverside, Montgomery County, Ohio 45404-2693

C. LATITUDE/LONGITUDE: 39 47' 51.25 N/84 07' 55.63 W

D. CURRENT OWNER/OPERATOR**

Name: Mullins Rubber Products, Inc. (contact is Bill Mullins Jr.)

Address: 2949 Valley Pike, Riverside, Montgomery County, Ohio 45404-2693

Telephone number: 937-233-4211

E. PAST OWNER(S)/OPERATOR(S): none

F. CERCLIS and SITE

CERCLIS ID: OHN000510489

SITE grant years and purpose:

Ohio EPA completed a Pre-CERCLIS Screening (PCS) report as part of the federal site assessment program on March 31, 2009. A site inspection (SI) was completed in August 2010, followed by an expanded SI (ESI) completed in July 2012. Ohio EPA is currently finishing a supplemental ESI (SESI). The purpose of these investigations was to determine if there had been VOC releases to soil or to groundwater as a result of operations at the Mullins Rubber Products, Inc. facility (MRP).

Field work for the SESI was completed in March 2013 and CLP data is pending. Preliminary laboratory and mobile laboratory screening data indicate that releases of tetrachloroethene (PCE) and trichloroethene (TCE) have resulted in shallow groundwater contamination which extends to at least MW-4 on Hypathia Avenue. MW-4 is approximately 850 feet west of MRP. A source area has not been documented but based on SESI preliminary data collected at SESI SB-14, the source is most likely close-by on MRP or on Paul's Garage property near SESI SB-14.

II. ASSESSMENT OF ENVIRONMENTAL HAZARDS AND PROPOSED RESPONSE ACTIONS

A. DESCRIPTION OF ACTUAL OR POTENTIAL CHEMICAL/ PHYSICAL HAZARDS POSED BY SITE:

PCE and TCE have been detected in shallow ground water. The plume of VOCs extends at least as far as MW-4 on Hypathia Avenue which is approximately 850 feet west of SESI SB-14. Hypathia Avenue is the first street in a residential subdivision located along and north of Valley Pike. 1,450 µg/l of PCE was detected in samples from MW-4. The water table is approximately 25 to 30 feet below ground surface and contaminated ground water poses a potential hazard through vapor intrusion to occupied structures.

B. LIST ACTUAL OR POTENTIAL HAZARD THAT MEETS ONE OR MORE OF THE REMOVAL RESPONSE CRITERIA OR EXCEEDS A REMOVAL ACTION LEVEL:

1. Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants;
There is potential for humans to VOCs through vapor intrusion.
2. Actual or potential contamination of drinking water supplies or sensitive ecosystems;
VOCs have been detected in public water supply wells within the Dayton Mad River Well Field.
3. Hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers that may pose a threat of release;
N/A
4. High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate;
N/A. Source soils have not been documented by past site assessments.
5. Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released;
High water levels during intense rainfall events may increase the risk of vapor intrusion to occupied structures.
6. Threat of fire or explosion;
N/A
7. The availability of other appropriate federal or state mechanisms to respond to the release;
Ohio EPA does not have the resources to quickly investigate the vapor intrusion pathway or to mitigate any occupied structures found to exceed vapor intrusion action levels. Referral to U.S. EPA is the only viable option for assessing the vapor intrusion threat.
8. Other situations or factors that may pose "threats to public health or welfare or the environment."
N/A

C. DESCRIPTION OF RESPONSE ACTIONS THAT SHOULD BE UNDERTAKEN TO REDUCE OR ELIMINATE HAZARDS: Evaluate the vapor intrusion pathway above the VOC ground-water plume or source area(s).

D. EXTENUATING OR MITIGATING CIRCUMSTANCES:

PCE was detected at a concentration of 1,450 µg/l in samples from MW-4. MW-4 is adjacent to occupied residential structures. Ground water is 25 to 30 feet below ground surface and surface soil types can vary from sand and gravel to clay-rich zones over short distances.

III. SITE DESCRIPTION AND BACKGROUND INFORMATION

A. SITE HISTORY AND OPERATIONS:

MRP began operations in 1942 as The Mullins Tire and Rubber Company. The primary operation at that time was retreading used tires. Other names the company used during its history include The Yellow Front Tire Shop, Bill Mullins Co. Inc, and Mullins Rubber Products.

In 1955, the business expanded from tires into molding different types of rubber products. Beginning in the mid-1960s, the company focused on molding heavy-duty truck trailer suspension bushings, the product line that continues today.

MRP is required to report halogenated solvent usage annually to the Regional Air Pollution Control Agency (RAPCA). After an anonymous source alleged the company was under-reporting the amount of solvents used, the Ohio EPA and RAPCA performed a surprise inspection on May 14, 2001.

It was determined by RAPCA and Ohio EPA that MRP had under-reported their TCE usage, kept false records and knowingly reported false data from 1995 to 2000. From 1995 until 1999, the combined emissions permit limit was 10,000 pounds per year. Actual emissions were calculated and ranged from 17,679 pounds in 1996 to 38,556 pounds in 1997.

In January of 2004, a seven-count criminal indictment was filed against MRP by the U.S. Attorney's Office in Dayton, Ohio.

In 2004, William R. Mullins, President of MRP pled guilty to making false statements when reporting airborne discharges of TCE and failing to submit a Title V air permit by the October 1996 deadline. Mr. Mullins was fined, sentenced to home confinement followed by probation and 100 hours of community service.

MRP now holds a Clean Air Act Title V operating permit that was issued January 16, 2008. TCE usage limit is a facility-wide rolling 12-month limit of 15.54 tons. There is no documented use of PCE.

Preliminary 2013 SESI results indicate that PCE and TCE have been released to ground water either from MRP or immediately adjacent to MRP on Paul's Garage property where SESI boring SB-14 was located.

B. SITE CHARACTERISTICS:

Site layout: SESI Prelim VOC Concentrations Map

Estimate of quantity, type and location of wastes and/or hazardous substances: N/A

Substances present (e.g., labels on drums and containers) and the condition of their containers or containment (e.g., drums, lagoons): N/A

Evidence of releases (e.g., stained soil, stressed vegetation, fire response reports and/or vandalism incident reports): N/A

Analytical data or other documentation on chemical characterization of wastes and contamination present: Three federal site assessments conducted by Ohio EPA have documented VOC contamination in ground water. No source soils have been documented but based on analytical data and ground-water flow direction, it appears that the source of VOCs is either MRP or Paul's Garage, the property immediately west and down-gradient of MRP.

IV. THREATS TO PUBLIC HEALTH AND THE ENVIRONMENT

A. POTENTIAL HUMAN AND ECOLOGICAL RECEPTORS:

Population density within a one mile radius (underline one):

1 to 100

100 to 1000

> 1000

Nearby land uses (e.g., agricultural, commercial, industrial, recreational, residential): **All**

Public accessibility (e.g., fences, posted signs, security): **Not fenced or posted except for some commercial properties.**

Distance to possible human and ecological receptors (e.g., residences, schools, drinking water sources, parks, wetlands, threatened or endangered species): **The residence at Paul's Garage is at risk due to proximity to the source and the ground-water plume emanating from it. Occupied structures along Hypathia Avenue near MW-4 and the neighborhood west of MW-4 are at risk for vapor intrusion from the shallow VOC ground-water plume. Public drinking water wells are located in the Dayton Mad River Well Field approximately 3,000 to 5,000 feet south and southwest of MRP.**

Locations of drinking water and monitoring wells (on site/immediate vicinity): **Ohio EPA has installed seven monitoring wells at MRP and the surrounding area. Four Ohio EPA monitoring wells are located on MRP. One active and two inactive production wells (cooling water) are located on the east side of MRP. A no longer used shallow production well is also in this portion of MRP. One shallow monitoring well was found at Paul's Garage on the northwest corner of the garage. One of the trucking company facilities on Transportation Road also has several shallow monitoring wells.**

Locations of surface water bodies (e.g., ponds, streams) and wetlands: **The Mad River is located about 3,700 feet south of MRP. Eastwood Lake is located about 2,000 feet south of MRP.**

Above ground and underground drainage channels or pathways (e.g., ditches, storm sewers, utilities): **A series of five cascading Class V injection wells (dry wells) were previously located on the north side of MRP and were used until late 2012, to dispose of non-contact cooling water and also rain and snow melt water. A depression in the northeast corner of MRP allowed direct flow of cooling water and runoff to drain into the shallow aquifer. The active production well was used to pump water through the cooling system. During the SI, the active deep production well was sampled and was found to be contaminated with VOCs which were being re-introduced into the shallow aquifer through the Class V injection wells. In 2012 MRP installed a closed-loop cooling system which only requires infrequent minimal "topping off" due to small losses of water from the closed loop. VOC-contaminated ground water is no longer being dispersed into the shallow aquifer via the class V injection wells. However, stormwater from the facility continues to be directed to the northeast corner of the property where which can result in temporary mounding of shallow ground water at that location.**

Blowing soils and air contaminants: **N/A**

V. CHRONOLOGY OF REMOVAL ACTION EVENTS N/A

VI. INDEX OF DOCUMENTS AND PHOTOGRAPHS

Mullins Rubber Products Inc PCS Report Site Location Map

Mullins Rubber Products, Inc SESI Boring Locations with Preliminary VOC Results

Mullins Rubber Products, Inc SESI Prelim PCE Conc with GW Contours

Mullins VISL-Calculator Results

VII. CONTACTS

Ohio EPA District Office Contact:

Name: Randy Watterworth E-mail address: randy.watterworth@epa.state.oh.us

Telephone No.: (937) 285-6062 Facsimile No.: (937) 285-6404

VIII. SIGNATURES

Submitted by (type name and title):

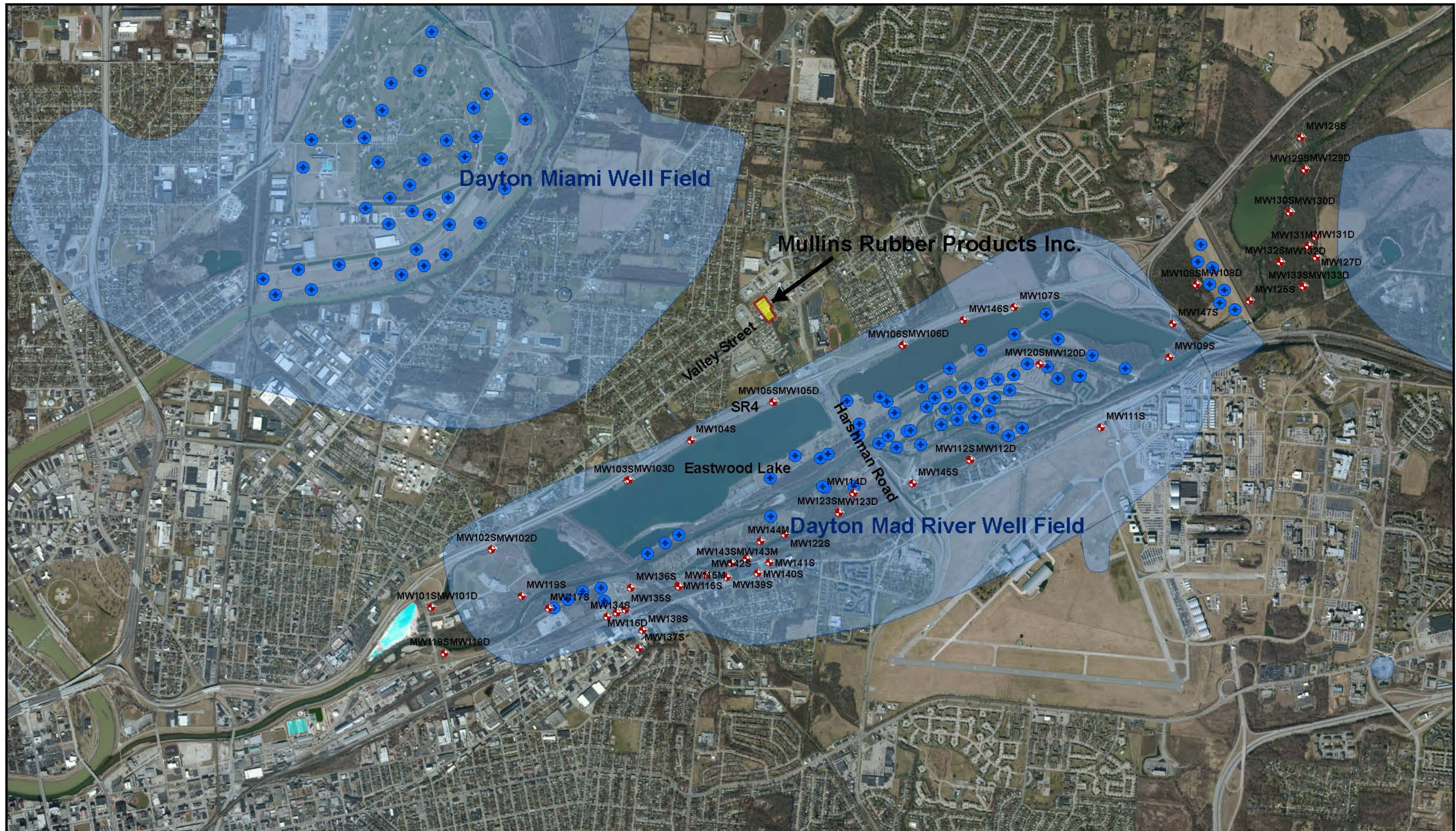
Randy Watterworth Date: May, 2013

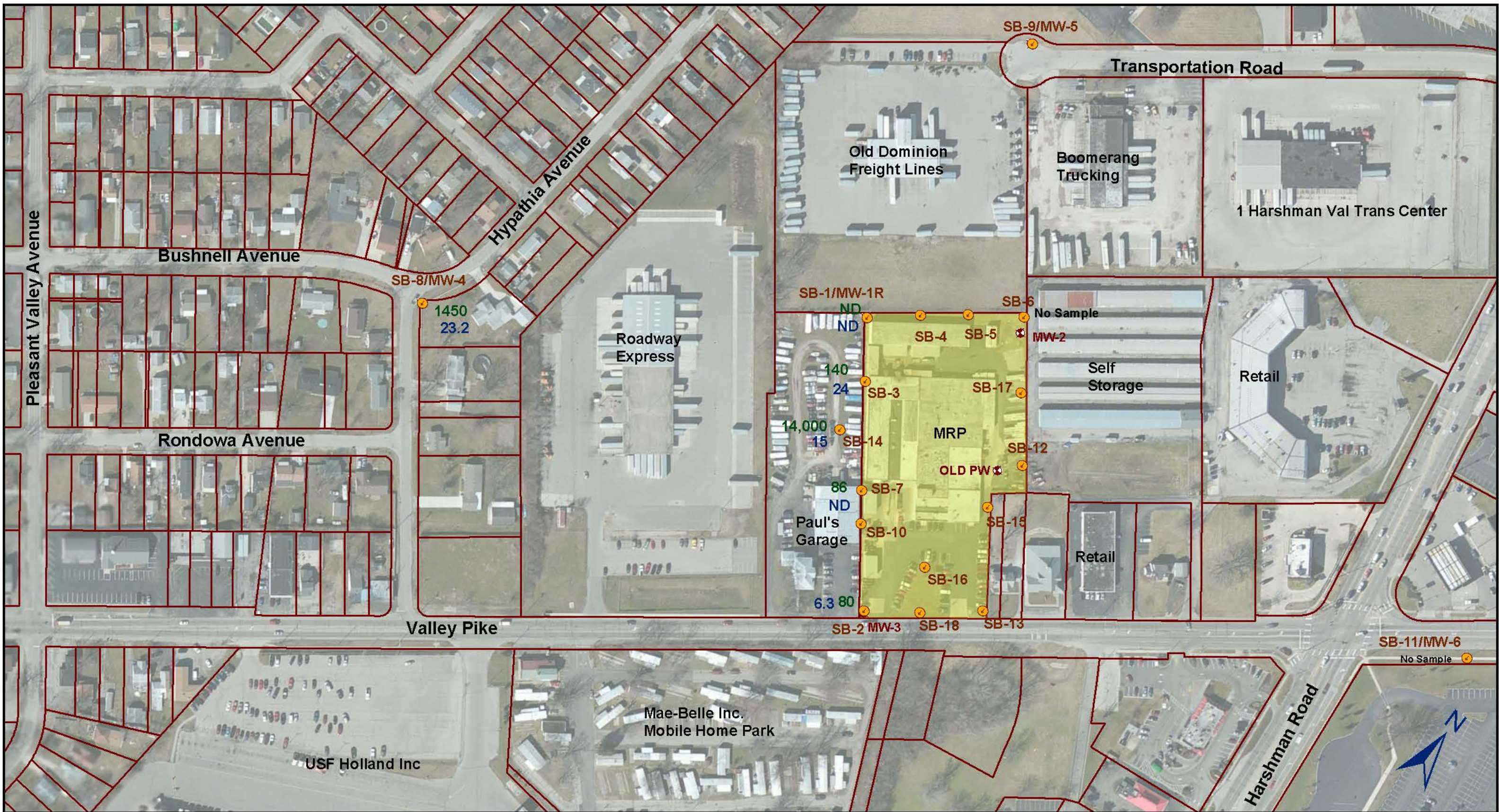
Approved by (type name and title):

Mike Starkey, Manager, DERR/SWDO Date: 5/2/13

Approved by (type name and title):

_____ Date: _____





May 1, 2013,
JRW
Aerial Source: World Imagery
37 Degree Counter-clockwise Rotation

Mullins Rubber Products Inc. Supplemental Expanded Site Inspection Boring and Well Locations with Preliminary VOC Concentrations



- LEGEND**
- SESI VAS Groundwater Locations
Some converted to Monitoring wells,
as noted.
 - ◆ Shallow Aquifer Wells
 - Mullins Rubber Products, Inc.
Property Boundary

Note: PCE concentrations are labeled in dark green,
TCE concentrations in dark blue. All concentrations
are in parts per billion.



Mullins Rubber Products Inc.
SES Preliminary PCE Concentrations
with Groundwater Contours

LEGEND

● SESI VAS Groundwater Locations

Note: ALS indicates confirmation results for samples analyzed by ALS Datachem. ML indicates screening level data from the Ohio EPA mobile laboratory.



OSWER VAPOR INTRUSION ASSESSMENT

Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.0, November 2012 RSLs

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Residential	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR	1.00E-05	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ	1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)
Average Groundwater Temperature (°C)	Tgw	12	Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations

CAS	Chemical Name	Site Groundwater Concentration	Calculated Indoor Air Concentration	VI Carcinogenic Risk	VI Hazard
		Cgw	Cia	CR	HQ
		(ug/L)	(ug/m ³)		
83-32-9	Acenaphthene		--	--	--
75-07-0	Acetaldehyde		--	--	--
67-64-1	Acetone		--	--	--
75-86-5	Acetone Cyanohydrin		--	--	--
75-05-8	Acetonitrile		--	--	--
98-86-2	Acetophenone		--	--	--
107-02-8	Acrolein		--	--	--
107-13-1	Acrylonitrile		--	--	--
107-05-1	Allyl Chloride		--	--	--
120-12-7	Anthracene		--	--	--
11104-28-2	Aroclor 1221		--	--	--
11141-16-5	Aroclor 1232		--	--	--
103-33-3	Azobenzene		--	--	--
100-52-7	Benzaldehyde		--	--	--
x 71-43-2	Benzene		--	--	--
108-98-5	Benzenethiol		--	--	--
98-07-7	Benzotrichloride		--	--	--
100-44-7	Benzyl Chloride		--	--	--
92-52-4	Biphenyl, 1,1'-		--	--	--
108-60-1	Bis(2-chloro-1-methylethyl) ether		--	--	--
111-44-4	Bis(2-chloroethyl) ether		--	--	--
542-88-1	Bis(chloromethyl) ether		--	--	--
107-04-0	Bromo-2-chloroethane, 1-		--	--	--
108-86-1	Bromobenzene		--	--	--
74-97-5	Bromochloromethane		--	--	--
75-27-4	Bromodichloromethane		--	--	--
74-83-9	Bromomethane		--	--	--
106-99-0	Butadiene, 1,3-		--	--	--
104-51-8	Butylbenzene, n-		--	--	--
x 75-15-0	Carbon Disulfide		--	--	--
56-23-5	Carbon Tetrachloride		--	--	--
75-68-3	Chloro-1,1-difluoroethane, 1-		--	--	--
126-99-8	Chloro-1,3-butadiene, 2-		--	--	--
107-20-0	Chloroacetaldehyde, 2-		--	--	--
108-90-7	Chlorobenzene		--	--	--
98-56-6	Chlorobenzotrifluoride, 4-		--	--	--
109-69-3	Chlorobutane, 1-		--	--	--
75-45-6	Chlorodifluoromethane		--	--	--
67-66-3	Chloroform		--	--	--
x 74-87-3	Chloromethane		--	--	--
107-30-2	Chloromethyl Methyl Ether		--	--	--
91-58-7	Chloronaphthalene, Beta-		--	--	--
95-57-8	Chlorophenol, 2-		--	--	--
76-06-2	Chloropicrin		--	--	--
95-49-8	Chlorotoluene, o-		--	--	--
106-43-4	Chlorotoluene, p-		--	--	--
123-73-9	Crotonaldehyde, trans-		--	--	--
98-82-8	Cumene		--	--	--
57-12-5	Cyanide (CN-)		--	--	--
460-19-5	Cyanogen		--	--	--
506-68-3	Cyanogen Bromide		--	--	--

Inhalation Unit Risk	IUR Source*	Reference Concentration	RFC Source*	Mutagenic Indicator
IUR		RfC		
(ug/m ³) ⁻¹		(mg/m ³)		i
2.20E-06	I	9.00E-03	I	
		3.10E+01	A	
		2.00E-03	X	
		6.00E-02	I	
		2.00E-05	I	
6.80E-05	I	2.00E-03	I	
6.00E-06	CA	1.00E-03	I	
5.70E-04	S			
5.70E-04	S			
3.10E-05	I			
7.80E-06	I	3.00E-02	I	
4.90E-05	CA	1.00E-03	P	
		4.00E-04	X	
1.00E-05	H			
3.30E-04	I			
6.20E-02	I			
6.00E-04	X			
		6.00E-02	I	
		4.00E-02	X	
3.70E-05	CA			
		5.00E-03	I	
3.00E-05	I	2.00E-03	I	
6.00E-06	I	7.00E-01	I	
		1.00E-01	I	
		5.00E+01	I	
3.00E-04	I	2.00E-02	I	
		5.00E-02	P	
		3.00E-01	P	
		5.00E+01	I	
2.30E-05	I	9.80E-02	A	
6.90E-04	CA	9.00E-02	I	
		4.00E-04	CA	
		4.00E-01	I	
		8.00E-04	S	

OSWER VAPOR INTRUSION ASSESSMENT

Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.0, November 2012 RSLs

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Residential	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR	1.00E-05	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ	1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)
Average Groundwater Temperature (°C)	Tgw	12	Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations

CAS	Chemical Name	Site Groundwater Concentration	Calculated Indoor Air Concentration	VI Carcinogenic Risk	VI Hazard
		Cgw	Cia	CR	HQ
		(ug/L)	(ug/m ³)		
506-77-4	Cyanogen Chloride		--	--	--
110-82-7	Cyclohexane		--	--	--
110-83-8	Cyclohexene		--	--	--
132-64-9	Dibenzofuran		--	--	--
96-12-8	Dibromo-3-chloropropane, 1,2-		--	--	--
124-48-1	Dibromochloromethane		--	--	--
106-93-4	Dibromoethane, 1,2-		--	--	--
74-95-3	Dibromomethane (Methylene Bromide)		--	--	--
764-41-0	Dichloro-2-butene, 1,4-		--	--	--
1476-11-5	Dichloro-2-butene, cis-1,4-		--	--	--
110-57-6	Dichloro-2-butene, trans-1,4-		--	--	--
95-50-1	Dichlorobenzene, 1,2-		--	--	--
x 106-46-7	Dichlorobenzene, 1,4-		--	--	--
x 75-71-8	Dichlorodifluoromethane		--	--	--
x 75-34-3	Dichloroethane, 1,1-		--	--	--
107-06-2	Dichloroethane, 1,2-		--	--	--
x 75-35-4	Dichloroethylene, 1,1-		--	--	--
x 540-59-0	Dichloroethylene, 1,2- (Mixed Isomers)		--	--	--
156-59-2	Dichloroethylene, 1,2-cis-		--	--	--
156-60-5	Dichloroethylene, 1,2-trans-		--	--	--
78-87-5	Dichloropropane, 1,2-		--	--	--
142-28-9	Dichloropropane, 1,3-		--	--	--
542-75-6	Dichloropropene, 1,3-		--	--	--
77-73-6	Dicyclopentadiene		--	--	--
75-37-6	Difluoroethane, 1,1-		--	--	--
94-58-6	Dihydrosafrole		--	--	--
108-20-3	Diisopropyl Ether		--	--	--
1445-75-6	Diisopropyl Methylphosphonate		--	--	--
121-69-7	Dimethylaniline, N,N-		--	--	--
120-61-6	Dimethylterephthalate		--	--	--
513-37-1	Dimethylvinylchloride		--	--	--
505-29-3	Dithiane, 1,4-		--	--	--
106-89-8	Epichlorohydrin		--	--	--
106-88-7	Epoxycyclobutane, 1,2-		--	--	--
759-94-4	EPTC		--	--	--
141-78-6	Ethyl Acetate		--	--	--
x 140-88-5	Ethyl Acrylate		--	--	--
75-00-3	Ethyl Chloride		--	--	--
60-29-7	Ethyl Ether		--	--	--
97-63-2	Ethyl Methacrylate		--	--	--
100-41-4	Ethylbenzene		--	--	--
75-21-8	Ethylene Oxide		--	--	--
151-56-4	Ethyleneimine		--	--	--
86-73-7	Fluorene		--	--	--
110-00-9	Furan		--	--	--
822-06-0	Hexamethylene Diisocyanate, 1,6-		--	--	--
110-54-3	Hexane, N-		--	--	--
591-78-6	Hexanone, 2-		--	--	--
74-90-8	Hydrogen Cyanide		--	--	--
NA (JP-7)	JP-7		No HLC	--	--
7439-97-6	Mercury (elemental)		--	--	--

Inhalation Unit Risk	IUR Source*	Reference Concentration	RFC Source*	Mutagenic Indicator
IUR		RfC		
(ug/m ³) ⁻¹		(mg/m ³)		i
		6.00E+00	I	
		1.00E+00	X	
6.00E-03	P	2.00E-04	I	Mut
2.70E-05	CA			
6.00E-04	I	9.00E-03	I	
		4.00E-03	X	
4.20E-03	P			
4.20E-03	P			
4.20E-03	P			
		2.00E-01	H	
1.10E-05	CA	8.00E-01	I	
		1.00E-01	X	
1.60E-06	CA			
2.60E-05	I	7.00E-03	P	
		2.00E-01	I	
		6.00E-02	P	
1.00E-05	CA	4.00E-03	I	
4.00E-06	I	2.00E-02	I	
		7.00E-03	P	
		4.00E+01	I	
1.30E-05	CA			
		7.00E-01	P	
1.30E-05	CA			
1.20E-06	I	1.00E-03	I	
		2.00E-02	I	
		1.00E+01	I	
		3.00E-01	P	
2.50E-06	CA	1.00E+00	I	
8.80E-05	CA	3.00E-02	CA	
1.90E-02	CA			
		1.00E-05	I	
		7.00E-01	I	
		3.00E-02	I	
		8.00E-04	I	
		3.00E-01	A	
		3.00E-04	I	

OSWER VAPOR INTRUSION ASSESSMENT

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CAS	Chemical Name	Site Groundwater Concentration	Calculated Indoor Air Concentration	VI Carcinogenic Risk	VI Hazard
		Cgw	Cia	CR	HQ
		(ug/L)	(ug/m ³)		
126-98-7	Methacrylonitrile		--	--	--
79-20-9	Methyl Acetate		--	--	--
96-33-3	Methyl Acrylate		--	--	--
78-93-3	Methyl Ethyl Ketone (2-Butanone)		--	--	--
108-10-1	Methyl Isobutyl Ketone (4-methyl-2-pentanone)		--	--	--
624-83-9	Methyl Isocyanate		--	--	--
80-62-6	Methyl Methacrylate		--	--	--
25013-15-4	Methyl Styrene (Mixed Isomers)		--	--	--
1634-04-4	Methyl tert-Butyl Ether (MTBE)		--	--	--
75-09-2	Methylene Chloride		--	--	--
90-12-0	Methylnaphthalene, 1-		--	--	--
91-57-6	Methylnaphthalene, 2-		--	--	--
98-83-9	Methylstyrene, Alpha-		--	--	--
8012-95-1	Mineral oils		--	--	--
64724-95-6	Naphtha, High Flash Aromatic (HFAN)		No HLC	--	--
91-20-3	Naphthalene		--	--	--
98-95-3	Nitrobenzene		--	--	--
75-52-5	Nitromethane		--	--	--
79-46-9	Nitropropane, 2-		--	--	--
924-16-3	Nitroso-di-N-butylamine, N-		--	--	--
88-72-2	Nitrotoluene, o-		--	--	--
111-84-2	Nonane, n-		--	--	--
109-66-0	Pentane, n-		--	--	--
75-44-5	Phosgene		--	--	--
123-38-6	Propionaldehyde		--	--	--
103-65-1	Propyl benzene		--	--	--
115-07-1	Propylene		--	--	--
75-56-9	Propylene Oxide		--	--	--
129-00-0	Pyrene		--	--	--
110-86-1	Pyridine		--	--	--
100-42-5	Styrene		--	--	--
630-20-6	Tetrachloroethane, 1,1,1,2-		--	--	--
x 79-34-5	Tetrachloroethane, 1,1,2,2-		--	--	--
x 127-18-4	Tetrachloroethylene	1.5E+03	5.03E+02	5.4E-05	1.2E+01
811-97-2	Tetrafluoroethane, 1,1,1,2-		--	--	--
109-99-9	Tetrahydrofuran		--	--	--
x 108-88-3	Toluene		--	--	--
76-13-1	Trichloro-1,2,2-trifluoroethane, 1,1,2-		--	--	--
87-61-6	Trichlorobenzene, 1,2,3-		--	--	--
120-82-1	Trichlorobenzene, 1,2,4-		--	--	--
x 71-55-6	Trichloroethane, 1,1,1-		--	--	--
x 79-00-5	Trichloroethane, 1,1,2-		--	--	--
x 79-01-6	Trichloroethylene		--	--	--
75-69-4	Trichlorofluoromethane		--	--	--
598-77-6	Trichloropropane, 1,1,2-		--	--	--
96-18-4	Trichloropropane, 1,2,3-		--	--	--
96-19-5	Trichloropropene, 1,2,3-		--	--	--
121-44-8	Triethylamine		--	--	--
526-73-8	Trimethylbenzene, 1,2,3-		--	--	--
95-63-6	Trimethylbenzene, 1,2,4-		--	--	--
108-67-8	Trimethylbenzene, 1,3,5-		--	--	--

Inhalation Unit Risk	IUR Source*	Reference Concentration	RFC Source*	Mutagenic Indicator
IUR		RfC		
(ug/m ³) ⁻¹		(mg/m ³)		
		3.00E-02	P	
		2.00E-02	P	
		5.00E+00	I	
		3.00E+00	I	
		1.00E-03	CA	
		7.00E-01	I	
		4.00E-02	H	
2.60E-07	CA	3.00E+00	I	
1.00E-08	I	6.00E-01	I	Mut
		1.00E-01	P	
3.40E-05	CA	3.00E-03	I	
4.00E-05	I	9.00E-03	I	
9.00E-06	P	2.00E-02	P	
2.70E-03	H	2.00E-02	I	
1.60E-03	I			
		2.00E-01	P	
		1.00E+00	P	
		3.00E-04	I	
		8.00E-03	I	
		1.00E+00	X	
		3.00E+00	CA	
3.70E-06	I	3.00E-02	I	
		1.00E+00	I	
7.40E-06	I			
5.80E-05	CA			
2.60E-07	I	4.00E-02	I	
		8.00E+01	I	
		2.00E+00	I	
		5.00E+00	I	
		3.00E+01	H	
		2.00E-03	P	
		5.00E+00	I	
1.60E-05	I	2.00E-04	X	
see note	I	2.00E-03	I	TCE
		7.00E-01	H	
		3.00E-04	I	Mut
		3.00E-04	P	
		7.00E-03	I	
		5.00E-03	P	
		7.00E-03	P	

OSWER VAPOR INTRUSION ASSESSMENT

Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.0, November 2012 RSLs

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Residential	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR	1.00E-05	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ	1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)
Average Groundwater Temperature (°C)	Tgw	12	Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations

CAS	Chemical Name	Site Groundwater Concentration Cgw (ug/L)	Calculated Indoor Air Concentration Cia (ug/m ³)	VI Carcinogenic Risk CR	VI Hazard HQ
108-05-4	Vinyl Acetate		--	--	--
593-60-2	Vinyl Bromide		--	--	--
x 75-01-4	Vinyl Chloride		--	--	--
108-38-3	Xylene, m-		--	--	--
x 95-47-6	Xylene, o-		--	--	--
x 106-42-3	Xylene, p-		--	--	--
x 1330-20-7	Xylenes		--	--	--

Inhalation Unit Risk IUR (ug/m ³) ⁻¹	IUR Source*	Reference Concentration RfC (mg/m ³)	RfC Source*	Mutagenic Indicator i
		2.00E-01	I	
3.20E-05	H	3.00E-03	I	
4.40E-06	I	1.00E-01	I	VC
		1.00E-01	S	
		1.00E-01	S	
		1.00E-01	S	
		1.00E-01	I	

Notes:

(1) Inhalation Pathway Exposure Parameters (RME):

Exposure Scenario

Averaging time for carcinogens (yrs)
Averaging time for non-carcinogens (yrs)
Exposure duration (yrs)
Exposure frequency (days/yr)
Exposure time (hr/day)

Units

Residential

Symbol	Value	Symbol	Value
ATc_R_GW	70	ATc_C_GW	70
ATnc_R_GW	30	ATnc_C_GW	25
ED_R_GW	30	ED_C_GW	25
EF_R_GW	350	EF_C_GW	250
ET_R_GW	24	ET_C_GW	8

Commercial

Selected (based on scenario)

Symbol	Value
ATc_GW	70
ATnc_GW	30
ED_GW	30
EF_GW	350
ET_GW	24

(2) Generic Attenuation Factors:

Source Medium of Vapors

Groundwater (-)
Sub-Slab and Exterior Soil Gas (-)

Residential

Symbol	Value	Symbol	Value
AFgw_R_GW	0.001	AFgw_C_GW	0.001
AFss_R_GW	0.1	AFss_C_GW	0.1

Commercial

Selected (based on scenario)

Symbol	Value
AFgw_GW	0.001
AFss_GW	0.1

(3) Formulas

Cia, target = MIN(Cia,c; Cia,nc)
Cia,c (ug/m3) = TCR x ATc x (365 days/yr) x (24 hrs/day) / (ED x EF x ET x IUR)
Cia,nc (ug/m3) = THQ x ATnc x (365 days/yr) x (24 hrs/day) x RfC x (1000 ug/mg) / (ED x EF x ET)

(4) Special Case Chemicals

Trichloroethylene

Residential

Symbol	Value	Symbol	Value
mIURTCE_R_GW	1.00E-06	IURTCE_C_GW	0.00E+00
IURTCE_R_GW	3.10E-06	IURTCE_C_GW	4.10E-06

Commercial

Selected (based on scenario)

Symbol	Value
mIURTCE_GW	1.00E-06
IURTCE_GW	3.10E-06

Mutagenic Chemicals

The exposure durations and age-dependent adjustment factors for mutagenic-mode-of-action are listed in the table below:

Note: This section applies to trichloroethylene and other mutagenic chemicals, but not to vinyl chloride.

Age Cohort	Exposure Duration	Age-dependent adjustment factor
0 - 2 years	2	10
2 - 6 years	4	3
6 - 16 years	10	3
16 - 30 years	14	1

Mutagenic-mode-of-action (MMOA) adjustment factor

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This factor is used in the equations for mutagenic chemicals.

Vinyl Chloride

See the Navigation Guide equation for Cia,c for vinyl chloride.

Notation:

I = IRIS: EPA Integrated Risk Information System (IRIS). Available online at: <http://www.epa.gov/iris/subst/index.html>

OSWER VAPOR INTRUSION ASSESSMENT

Groundwater Concentration to Indoor Air Concentration (GWC-IAC) Calculator Version 3.0, November 2012 RSLs

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Residential	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR	1.00E-05	Enter target risk for carcinogens (for comparison to the calculated VI carcinogenic risk in column F)
Target Hazard Quotient for Non-Carcinogens	THQ	1	Enter target hazard quotient for non-carcinogens (for comparison to the calculated VI hazard in column G)
Average Groundwater Temperature (°C)	Tgw	12	Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations

CAS	Chemical Name	Site Groundwater Concentration	Calculated Indoor Air Concentration	VI Carcinogenic Risk	VI Hazard
		Cgw	Cia	CR	HQ
		(ug/L)	(ug/m ³)		

Inhalation Unit Risk	IUR Source*	Reference Concentration	RFC Source*	Mutagenic Indicator
IUR		RfC		
(ug/m ³) ⁻¹		(mg/m ³)		

P = PPRTV. EPA Provisional Peer Reviewed Toxicity Values (PPRTVs). Available online at: <http://hhpprtv.ornl.gov/pprtv.shtml>

A = Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels (MRLs). Available online at: <http://www.atsdr.cdc.gov/mrls/index.html>

CA = California Environmental Protection Agency/Office of Environmental Health Hazard Assessment assessments. Available online at: <http://www.oehha.ca.gov/risk/ChemicalDB/index.asp>

H = HEAST. EPA Superfund Health Effects Assessment Summary Tables (HEAST) database. Available online at: <http://epa-heast.ornl.gov/heast.shtml>

S = See RSL User Guide, Section 5

X = PPRTV Appendix

Mut = Chemical acts according to the mutagenic-mode-of-action, special exposure parameters apply (see footnote (4) above).

VC = Special exposure equation for vinyl chloride applies (see Navigation Guide for equation).

TCE = Special mutagenic and non-mutagenic IURs for trichloroethylene apply (see footnote (4) above).

Yellow highlighting indicates site-specific parameters that may be edited by the user.

Blue highlighting indicates exposure factors that are based on Risk Assessment Guidance for Superfund (RAGS) or EPA vapor intrusion guidance, which generally should not be changed.

Pink highlighting indicates VI carcinogenic risk greater than the target risk for carcinogens (TCR) or VI Hazard greater than or equal to the target hazard quotient for non-carcinogens (THQ).